CORN & PEAS FOR PROCESSING

PRODUCTION COSTS & RETURNS SOUTHERN ALBERTA 1969

PRODUCTION ECONOMICS BRANCH — ECONOMICS DIVISION
ALBERTA DEPARTMENT OF AGRICULTURE

SWEET CORN AND GREEN PEAS

FOR PROCESSING

PRODUCTION COSTS AND RETURNS

SOUTHERN ALBERTA, 1969

by

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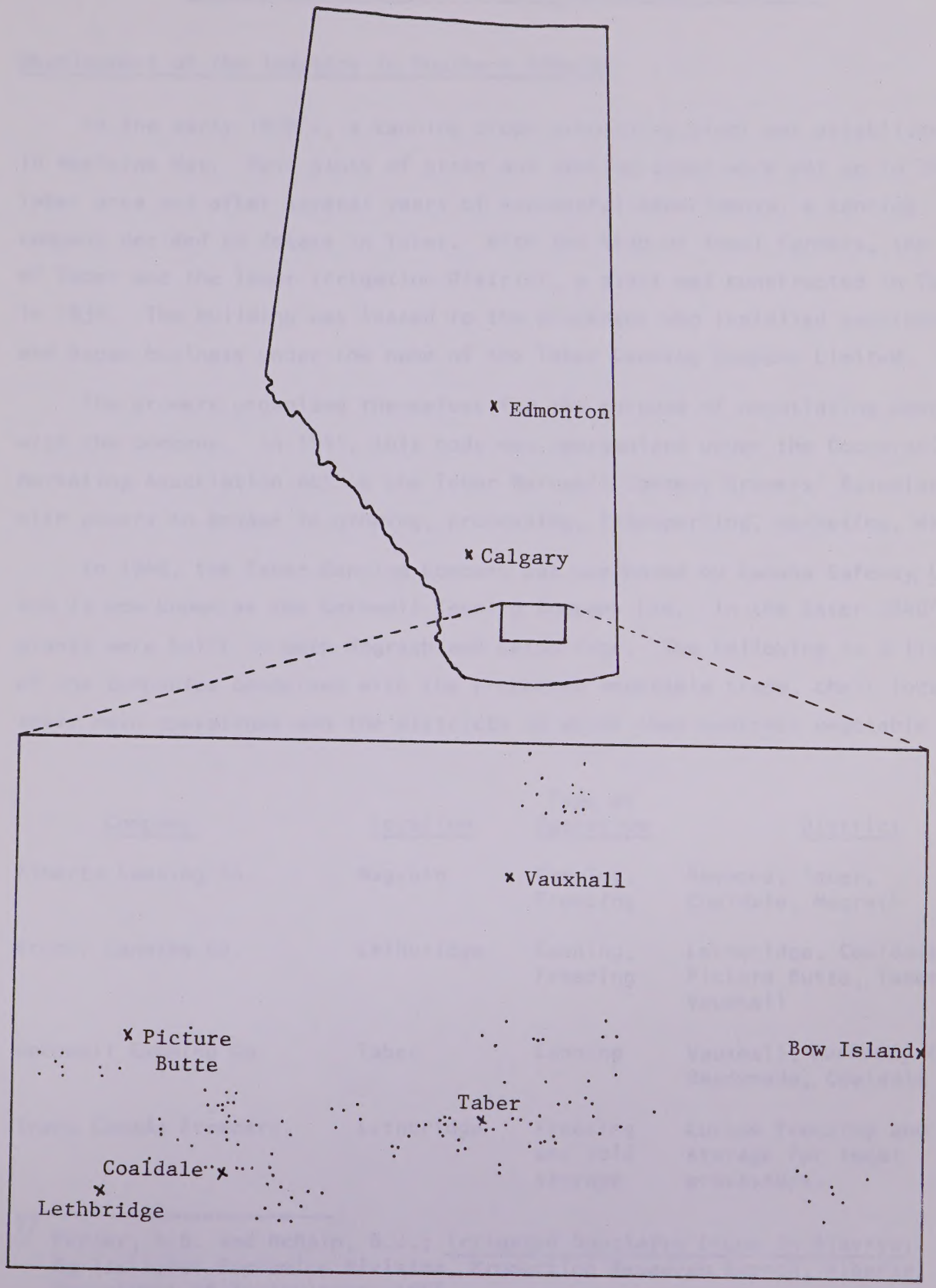
FOREWARD

The fact that most of the presently irrigated area lies in the southern part of the province and is favoured with a relatively long growing season and high summer temperatures has tended to make certain sectors of this area the major sources of commercial vegetable crops in Alberta.

Production of these crops continues to contribute significantly to the rural and urban economy of the area. Among the kinds of processed products emerging from the vegetable plants at Lethbridge, Taber and Magrath, peas and corn are the most important. From time to time, economic studies have been undertaken to provide pertinent information on costs and returns at the grower level. The Alberta Vegetable Marketing Board requested the present study and assisted in its progress. The resulting report, based on a stratified sample of the contracting growers, provides some insight into economic conditions in the primary production of peas and corn in this region.

K.D. Porter, Acting Head,
Production Economics Branch.

MAP SHOWING DISTRIBUTION
OF SWEET CORN & GREEN PEA GROWERS IN ALBERTA



SECTION I - CORN AND PEAS FOR PROCESSING IN ALBERTA

Development of the Industry in Southern Alberta

In the early 1930's, a canning crops processing plant was established in Medicine Hat. Test plots of green and canning crops were set up in the Taber area and after several years of successful experiments, a canning company decided to locate in Taber. With the help of local farmers, the town of Taber and the Taber Irrigation District, a plant was constructed in Taber in 1934. The building was leased to the processor who installed machinery and began business under the name of the Taber Canning Company Limited.

The growers organized themselves for the purpose of negotiating contracts with the company. In 1941, this body was reorganized under the Cooperative Marketing Association Act as the Taber Barnwell Cannery Growers' Association with powers to engage in growing, processing, transporting, marketing, etc.[1/]

In 1948, the Taber Canning Company was purchased by Canada Safeway Ltd. and is now known as the Cornwall Canning Company Ltd. In the later 1940's, plants were built in both Magrath and Lethbridge. The following is a list of the companies concerned with the processed vegetable trade, their location, their main operations and the districts in which they contract vegetable crops.

Company	Location	Type of Operation	District
Alberta Canning Co.	Magrath	Canning, Freezing	Raymond, Taber, Coaldale, Magrath
Broder Canning Co.	Lethbridge	Canning, Freezing	Lethbridge, Coaldale, Picture Butte, Taber, Vauxhall
Cornwall Canning Co.	Taber	Canning	Vauxhall, Burdett, Taber, Readymade, Coaldale
Trans Canada Freezers	Lethbridge	Freezing and cold storage	Custom freezing and cold storage for local processors.

1/ Porter, K.D. and McBain, B.J.; Irrigated Specialty Crops in Alberta; Agricultural Economics Division, Production Research Branch, Alberta Department of Agriculture; 1958.

In 1958, the growers voted for the establishment of a Producer's Marketing Board. The Alberta Vegetable Marketing Board was set up under provincial legislation (The Marketing of Agricultural Products Act). The Board appoints members to a "Negotiating Committee" which, in the spring of the year, negotiates with processors, terms and conditions of a contract between the producers they represent and the companies which are contracting the crops involved. Terms and conditions include price per unit produced, cost of seed, procedure for deductions, responsibilities of each party, etc.

Statistics

Southern Alberta has suitable conditions in terms of natural resources and climatic conditions to maintain and expand the production of the high quality specialty crops required for canning and freezing. In Alberta, corn and peas account for over 80% of the supply of crops grown for processing. This however accounts for less than 10% of Canadian production as indicated by Figures 1 and 2. Figures 1 to 4 indicate a decline in farm production of these crops since 1962. These production trends may have been affected by decisions made by both farmers and processing plants.

Figure 1 - Sweet Corn - 1960-69
Acres Per Year

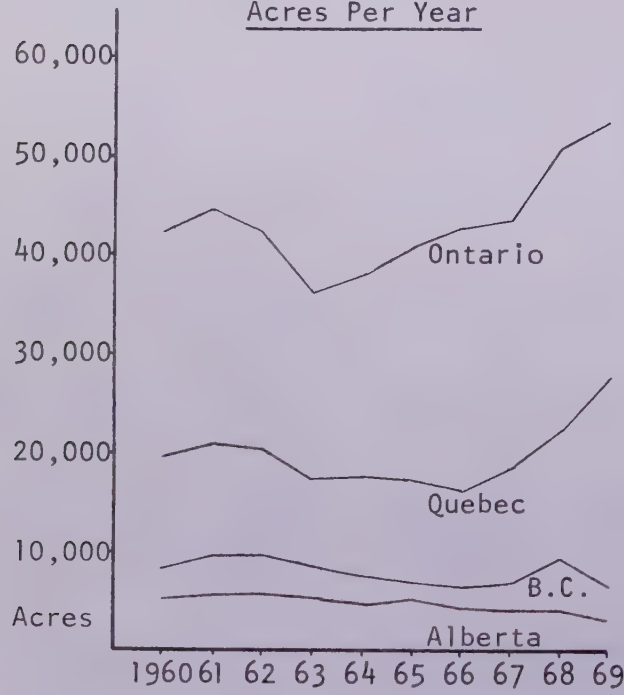
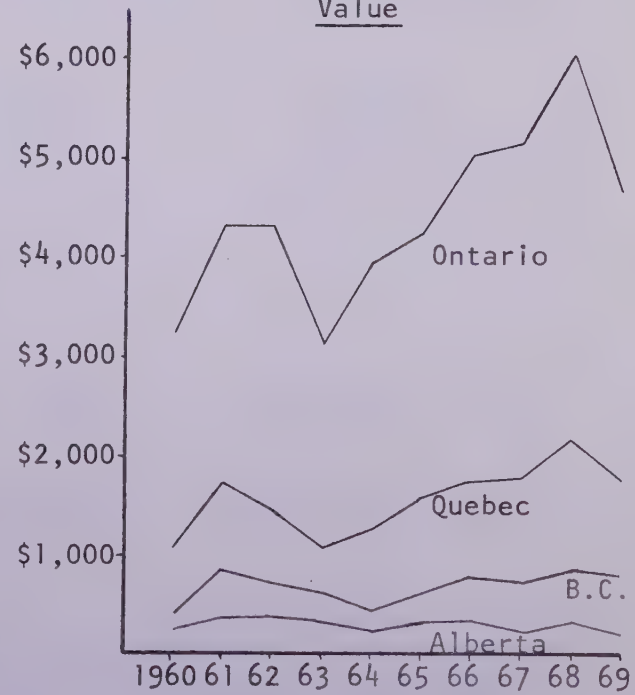


Figure 2 - Sweet Corn - 1960-69
Value



Source: Statistics Canada No. 22-003

Figure 3 - Green Peas - 1960-69
Acres Per Year

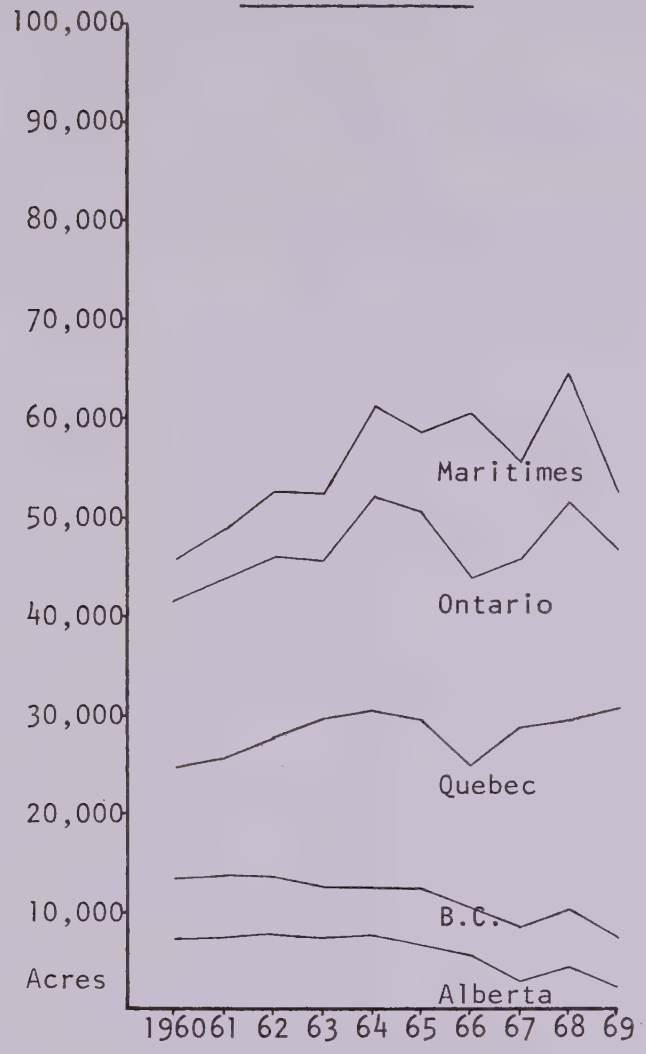
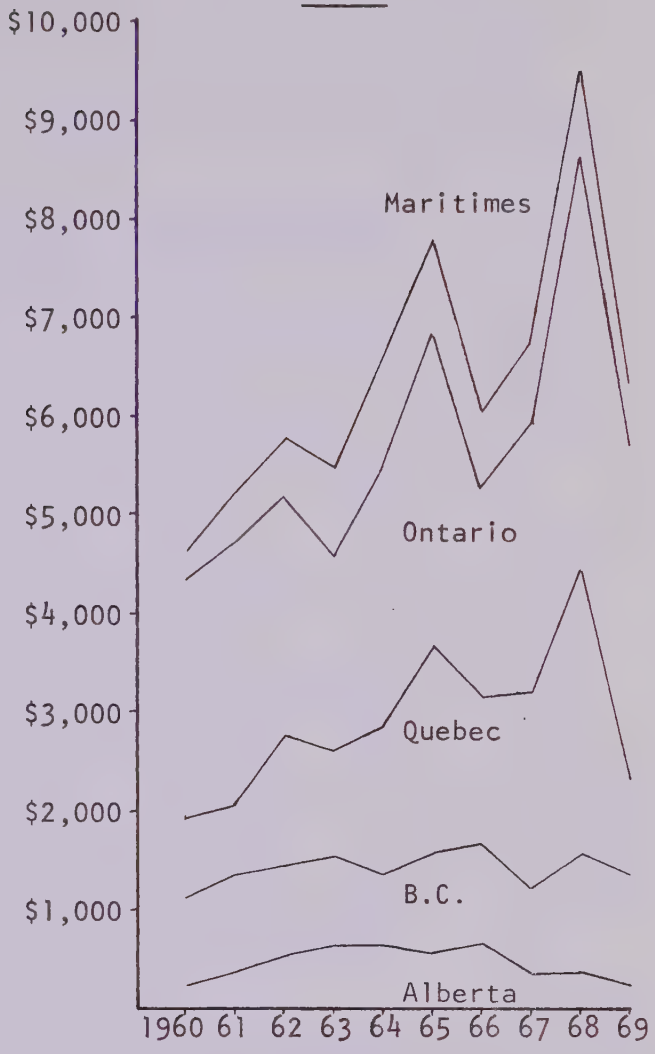


Figure 4 - Green Peas - 1960-69
Value



Source: Statistics Canada No. 22-003

Projected plant sales are directly related to the required supply which in turn means greater or smaller acres allotted to growers. The processing plants in Southern Alberta must compete with similar products available from Eastern Canada and the United States. The total volume of goods processed by plants in Eastern Canada and the United States is much greater. They are often closer to large population centers as well as to suppliers of materials such as cans, labels, and equipment required by the plant. While the scope of this study is limited to the analysis of farm production costs and returns, this phase however is only one of the sectors that influence the competitive position of the industry in Alberta. It is evident that the growth of this industry is heavily dependant on the retail price that the product can command once it has been processed and transported to the place where it will be consumed.

SWEET CORN

Table 1 Average Farm Price (Per Ton), Yield (Tons) and Value Per Acre in Canada

	CANADA			QUEBEC			ONTARIO			ALBERTA			BRITISH COLUMBIA		
	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE
'69	4.04	26.99	109.15	3.85	21.10	81.26	3.89	29.48	114.54	--	--	--	5.81	28.23	164.02
68	4.55	26.85	122.22	4.47	24.14	107.95	4.50	29.56	133.51	--	--	--	4.95	19.08	94.27
67	4.42	28.65	126.65	3.43	26.91	92.25	4.61	29.71	136.87	--	--	--	7.04	25.98	182.96
66	4.50	21.30	95.94	4.40	--	--	4.45	28.00	124.59	3.69	20.62	76.04	6.98	26.35	183.95
65	4.15	23.87	98.86	3.65	24.01	88.09	6.85	26.18	119.61	2.30	--	--	6.35	26.03	165.48
64	4.20	25.04	105.41	3.45	22.30	77.12	5.15	26.48	135.87	2.65	20.38	54.49	3.80	25.97	74.82
63	3.50	24.77	86.39	2.25	21.78	49.10	4.05	26.88	109.27	3.35	18.20	61.14	4.65	25.97	96.63
62	4.17	24.61	102.69	3.30	21.25	70.06	5.00	26.42	132.00	3.35	19.50	65.46	3.80	25.96	82.72
61	3.28	26.96	88.30	3.11	23.99	74.58	4.14	26.40	109.41	--	--	--	3.20	39.39	126.82
60	31.63	24.25	76.70	2.44	23.99	58.55	3.70	26.07	96.34	3.13	14.84	46.42	2.90	24.98	51.91
59	3.10	24.95	77.00	2.45	25.42	62.51	3.50	26.07	91.77	3.45	19.00	65.35	3.00	25.06	54.49
58	3.35	24.74	82.58	2.95	23.95	70.15	3.75	26.41	99.38	3.50	18.61	64.91	2.35	22.04	31.75
57	3.25	--	--	2.75	24.28	67.38	3.30	25.52	83.04	4.25	24.28	103.50	4.00	26.04	90.72

Source: Statistics Canada No. 22-003

GREEN PEAS

Table 2 Average Farm Price (Per Ton), Yield (Tons) and Value Per Acre in Canada

	CANADA			QUEBEC			ONTARIO			ALBERTA			BRITISH COLUMBIA			MARITIMES		
	TONS/ ACRES	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE	TONS/ ACRE	PRICE/ TON	VALUE/ ACRE
'69	1.01	101.47	120.48	0.70	76.82	53.20	1.30	125.98	161.90	1.40	73.02	103.26	2.00	112.52	222.72	1.22	84.15	--
68	1.50	94.00	139.36	1.20	122.05	146.97	1.60	118.64	192.84	1.45	--	--	1.98	110.00	218.39	1.42	--	--
67	1.11	98.27	109.42	0.73	144.29	104.96	1.22	111.84	136.57	--	--	--	2.22	89.96	199.55	1.16	--	--
66	1.24	60.16	74.76	0.94	--	--	1.14	96.69	110.69	1.31	110.69	120.90	1.91	114.78	218.86	1.61	--	--
65	1.43	74.91	107.38	1.40	88.00	125.45	1.47	103.24	152.02	1.35	--	--	1.75	101.49	178.44	1.21	--	--
64	1.13	94.78	106.97	0.87	86.01	74.57	1.33	98.95	131.68	1.00	83.77	84.48	1.65	97.18	158.77	1.09	105.12	114.13
63	1.10	95.85	104.56	0.70	94.27	64.51	1.12	106.97	119.71	0.95	92.55	87.23	1.85	91.73	168.96	1.60	83.92	134.05
62	1.25	90.17	110.86	1.10	86.53	94.13	1.30	100.41	131.90	0.90	73.72	67.75	1.65	91.83	153.08	1.26	77.95	98.51
61	0.94	95.01	89.25	0.76	80.00	60.48	1.45	100.15	144.97	--	--	--	1.60	94.69	153.83	--	--	--
60	1.10	92.26	101.80	0.96	72.00	69.19	1.36	103.58	140.62	0.48	74.00	35.72	1.50	99.70	148.54	1.00	81.31	79.43
59	1.11	94.18	105.00	0.73	99.55	72.47	1.24	101.72	126.64	1.15	73.03	83.02	1.45	98.62	145.11	1.20	76.60	90.54
58	1.20	98.57	117.77	0.97	85.57	83.22	1.34	116.55	156.32	1.05	74.78	77.52	1.20	99.10	118.02	1.54	74.20	113.94
57	1.35	98.79	131.07	1.44	97.44	140.31	1.35	99.62	132.88	0.85	97.42	82.35	1.50	99.99	150.25	1.31	97.43	127.71

Source: Statistics Canada No. 22-003

SECTION II - ORGANIZATION OF THE STUDY

The Sample

A systematic sample of growers with contracts in 1969 was the basis of selection for this study. This sample accounted for approximately 25% of the growers and acres under contract. The Alberta Vegetable Marketing Board provided assistance by doing the original contact work with the selected participants. Each candidate was required to keep physical records of field operations performed on the acres under study. This included a list of the type and amount of materials, machinery and labour used as the growing season progressed.

Objectives

Once a grower has made the decision to produce a crop, he has chosen to allocate a portion of his resources (land, labour, capital and management) to it. Considering the existing restrictions and risk at the time he makes this decision, he feels that the returns from this particular crop will be comparable at least to returns from another crop with similar input requirements. The purpose of this report is to:

1. determine production costs and returns;
2. analyze factors which cause variations in costs and returns among farms; and
3. provide data that can be an aid to farm planning and decision making in areas where these crops are produced.

Description of Farms

The relative value of crops grown can be indicated, in a general way, by the percentages of cultivated acreages sown to each crop. Because of the wide range in the size (acres) of farms, as well as the many different crops grown, it is difficult to ascertain whether the percentages presented accurately reflect the makeup for all growers of processing corn and peas in Southern Alberta. For the nine corn growers on the study, cultivated acreage ranged from 100 to 1,300 with an average of 635 acres. For the eighteen pea

growers, cultivated acreage ranged from 75 to 750 with an average of 320 acres. Over 90% of the cultivated land was under irrigation. Table 3 outlines the proportion of cultivated land in the crops listed.

Table 3 Cropping Pattern of Study Farms as % of Cultivated Acres - 1969

	CORN		PEAS	
No. of Farms	9		18	
Average Size (acres)	640		320	
Range (acres)	105 to 1300		75 to 750	
CROP	%		%	
Wheat	22.6		18.4	
Oats	2.0	40.2	5.0	41.3
Barley	15.6		17.9	
Peas	2.3		13.8	
Corn	7.9		0.7	
Sugar Beets	10.7	31.0	8.6	24.3
Potatoes	10.1		1.2	
Tame Hay	4.7		9.3	
Summerfallow	18.8		13.1	
Tame Pasture	3.7	22.5	6.3	19.4
Other Crops[1/]	1.6		5.7	
Total	100.0		100.0	

1/ Other crops represent a combination of flax, dry peas, beans, carrots, cabbage, greenfeed, etc.

The importance of cereal crops as a source of income was evident on farms which grew corn and peas for processing. Except for a few farms, all grew wheat and barley. Growers with corn contracts were, on the average, farms of greater size, with significant acreage in specialty crops in addition to corn. Both sugar beets and potatoes were of greater importance on the farms with corn contracts than was corn itself. Specialty crops accounted for 24.3% of cultivated acreage for the pea growers, with green pea production making up more than half of this at 13.8%. As a percentage, summerfallow and tame pasture were nearly the same for each group. The smaller farms, from which the pea growers were chosen, had a greater percentage of their acreage in other crops such as beans, flax, cabbage, etc.

As a group and according to acres of crop, corn ranked fifth while peas ranked third on the farms where they were produced. Many of these farms have livestock enterprises, the production and value of which has not been measured in this study. These, however, are important supplementary and complementary enterprises which are considered by the growers when cropping programs are established.

The 1969 Growing Season[1/]

Until the middle of June, the growing areas experienced warm, dry weather with rains being timely for all crops. The heaviest rains were received by the Lethbridge area and the areas north and west of Coaldale. Rainfall in the Burdett and Bow Island area was less than that received in other areas. Hail damage was at a minimum during the summer months with the Burdett and Coaldale area being affected.

The pea harvest got under way on July 9 but proceeded slowly because of cool, damp weather in late June. Persistant cool nights in early July retarded maturity.

The 1969 pea crop was rather light with early varieties yielding around one ton per acre. Average yields reported at Lethbridge were 1.236 tons per acre while at Taber, they were 1.473 tons per acre.

1/ Alberta Vegetable Marketing Board; Inspector's Field Report for the 1969 Growing Season.

Because of second growth, processors had problems harvesting peas in the desired conditions. A high waste factor (up to 39%) reduced the amount of fancy peas available for processing. Of all acres grown for green peas, only 70 or 80 were left for seed.

Corn yields were not as good as expected with Lethbridge reporting 3.2 tons per acre and Taber reporting 4 tons per acre. Some fields were extremely dry and the quality of the corn was poor. Bird damage was rather severe in some fields. About 80 acres of corn were by-passed because of over-maturity or bird damage.

Definition of Terms

Sweet Corn - corn grown for canning and/or freezing.

Green Peas - peas grown for canning and/or freezing.

Gross Returns - include cash receipts from the sale of the crop to the processors, plus miscellaneous income such as the value of vines fed to livestock. Inventory adjustments are not necessary since all income from the crop is realized during the year of production.

Land Costs - fixed costs based on sown acres, which consist of irrigation and land taxes as well as a 6% interest charge per acre on the market value of the land.

Labour Costs - operator's labour is valued at $1.40 per hour for hours allocated to the crop. Unpaid family labour is valued at $1.10 per hour while hired labour was charged at actual cost.

Material Costs - Seed is supplied by the processor at a cost of $0.12 per pound for peas and $0.50 per pound for corn. Fertilizer and sprays are charged at actual cost.

Machinery and Equipment Costs - operating costs (fuel, oil, grease, repairs) were determined for all machinery and equipment according to size and use. Depreciation, interest, insurance and housing were based on value and annual use. Rented machinery was charged at actual cost.

Custom Work - harvesting of peas (including hauling) is $18.00 per ton for shelled peas and $3.50 per net ton for corn. Corn growers have a choice of either letting the factory arrange trucking from the field to the factory or doing it themselves. If they haul the crop themselves, they receive a hauling allowance. Otherwise, a custom trucking charge is levied by the factory. In the study, custom hauling only is charged as trucking. The hauling rebate is assumed to equal the grower's cost of hauling the crop himself.

Cash Costs - include land and irrigation taxes, hired labour, materials, machinery operating expenses (fuel, oil, repairs, etc.), custom work, hauling, fees and insurance.

Non-Cash Costs - include interest on investment, depreciation, insurance, housing of machinery and operator and family labour.

Early and Late Peas - classification used to distinguish between peas sown and harvested at different time periods of the growing season. Early peas are valued higher per ton than late peas because of their tenderness and smaller size. The price schedule is contained in Section VI.

Tenderometer Reading - samples from each load of peas are subjected to mechanical pressure. Their resistance is read on a scale graduated from 0 to 126 and over. The relationship between this reading and the established price determines the cash value of a ton of peas.

SECTION III - AVERAGE PRODUCTION COSTS AND RETURNS

The average figures presented in Section III reflect both costs and returns per acre for all acres in production. Variations in production costs and returns occur between years, areas and farms. The profitability of a crop is evaluated with respect to the restrictions and alternatives present on each farm. Although the net return obtained from the production of sweet corn and green peas is higher than many other field crops, it should be emphasized that these crops are mainly supplementary and not major enterprises. The fact that each grower is limited as to the number of acres he can allocate to these crops means that a restriction exists as to the total income which can be expected from each crop. Since there is no limit on the number of tons sold, a great deal of expense is incurred in maximizing yields. The break-even analysis provided in this section emphasizes the importance of yields and their relationship to costs and returns per acre. The break-even analysis is based on average figures and should be adjusted for individual farm use. Costs are grouped on a cash and non-cash basis to coincide with expenses which must be covered in the short run and those which must be covered in the long run.

In the tables, production costs are classified according to 1) expenses associated with land, labour and capital, and 2) seasonal operations where labour, materials and machine expenses are incurred within certain time periods of the production year. Except for operator and family labour, these costs are of a cash nature and can be used for projecting a cash flow statement for the enterprise.

Included in this section is a comparison between corn and pea production insofar as costs, returns and labour requirements concern the two crops.

A. SWEET CORN

Gross Returns

An average yield of 3.31 tons per acre at a value of $25.30 per ton returned $83.76 per acre to the grower. The cash sale of the crop accounted for the major portion of gross returns. A basic price of $25.00 per ton was paid the grower after adjustments for quality were made. Adjustments were made for defects such as ears being less than 4 inches, over-maturity, frost, heat damage, etc.

Production Costs

Expenses are classified according to input in Table 4, page 13. Total production costs were $71.81 per acre and $21.70 per ton produced. Land costs of $18.68 per acre were the largest single production expense followed by material costs at $17.33 per acre and custom work (harvesting) at $16.67 per acre. Machinery costs were $9.80 per acre while labour costs amounted to $7.67 per acre. Cash costs were 66% of total production costs while non-cash costs were 34%.

In Table 5, page 14, production costs are classified according to field operations. Fall cultivation and fertilizer application amounted to $1.11 per acre. Seed bed preparation and seeding expenses of $21.27 per acre accounted for 46.2% of the operation costs while summer operation costs of $6.96 per acre accounted for 15.1% of total operation costs. As expected, the heaviest demand for labour occurred during the summer when irrigation operations were carried out.

Gross Cash Margin and Net to Risk and Management

When cash expenses were subtracted from cash receipts, the growers were left with an average of $35.25 per acre. The gross cash margin figure is often used by growers to compare the profitability of crops. They are willing to accept more risk and heavier labour requirements if sufficient cash returns are generated. Net to risk and management, the residue after all direct and opportunity costs have been subtracted from gross value was $623.16 per enterprise, $3.60 per ton and $11.95 per acre.

Table 4 Average Costs and Returns Per Enterprise, Per Acre, And Per Ton for Sweet Corn, 1969

No. of Enterprises	9
Average Size/Enterprise (acres)	52.18
Average Yield/Acre (tons)	3.31

	Per Enterprise	Per Ton	Per Acre	% of Total Cost
Receipts				
Value of corn sold	$4317.63	$25.00	$82.77	
Other misc. income	51.67	0.30	0.99	
Gross Returns	4369.30	25.30	83.76	
Expenses				
Land Costs				
Taxes	255.39	1.48	4.89	
Interest	719.61	4.17	13.79	
Total	975.00	5.65	18.68	26.0
Labour Costs				
Operator	250.21	1.45	4.80	
Family	15.75	0.09	0.30	
Hired	134.10	0.78	2.57	
Total	400.06	2.32	7.67	10.7
Material Costs				
Seed	288.95	1.67	5.54	
Fertilizer	602.50	3.49	11.54	
Spray	12.89	0.07	0.25	
Total	904.34	5.23	17.33	24.1
Machinery-Equipment				
Tractor	366.29	2.12	7.03	
Implements & Equipment	144.55	0.84	2.77	
Total	510.84	2.96	9.80	13.6
Custom Work				
Harvesting	604.46	3.50	11.59	
Hauling	265.08	1.54	5.08	
Total	869.54	5.04	16.67	23.2
Other (fees, insurance)	86.36	0.50	1.66	2.3
TOTAL PRODUCTION COSTS	3746.14	21.70	71.81	100.0
NET TO RISK & MANAGEMENT	623.16	3.60	11.95	
CASH RECEIPTS	4317.63	25.00	82.77	
CASH EXPENSES	2478.62	14.36	47.52	
GROSS CASH MARGIN	1839.01	10.64	35.25	

Table 5 Average Costs and Returns Per Acre According to Field Operations for Processing Corn

No. of Enterprises	9
Average Size/Enterprise (acres)	52.18
Average Yield/Acre (tons)	3.31

	Value Per Acre	Hours Per Acre	% of Total Costs
Gross Returns	$83.76		
Pre-Season Expenses			
Labour	0.24	0.16	
Machinery (operating)	0.30	0.14	
Material (fertilizer)	0.57		
Total	1.11		2.4
Seed Bed Preparation			
Labour	2.40	1.67	
Machinery (operating)	2.36	1.65	
Material (fertilizer, seed)	16.51		
Total	21.27		46.2
Summer Operations			
Labour	4.98	3.92	
Machinery	1.73	3.17	
Material (spray)	0.25		
Total	6.96		15.1
Fall Operations	16.72		36.3
TOTAL OPERATION COSTS	46.06		100.0
+ OTHER CASH COSTS (TAXES)	6.56		
+ INTEREST & DEPREC. ON MACH.-EQUIP.	5.40		
+ INTEREST ON LAND	13.79		
TOTAL PRODUCTION COSTS	$71.81		

Break-Even Analysis for Sweet Corn

Figure 5 The Relationship Between Yields and Costs and Returns Of Sweet Corn, 1969

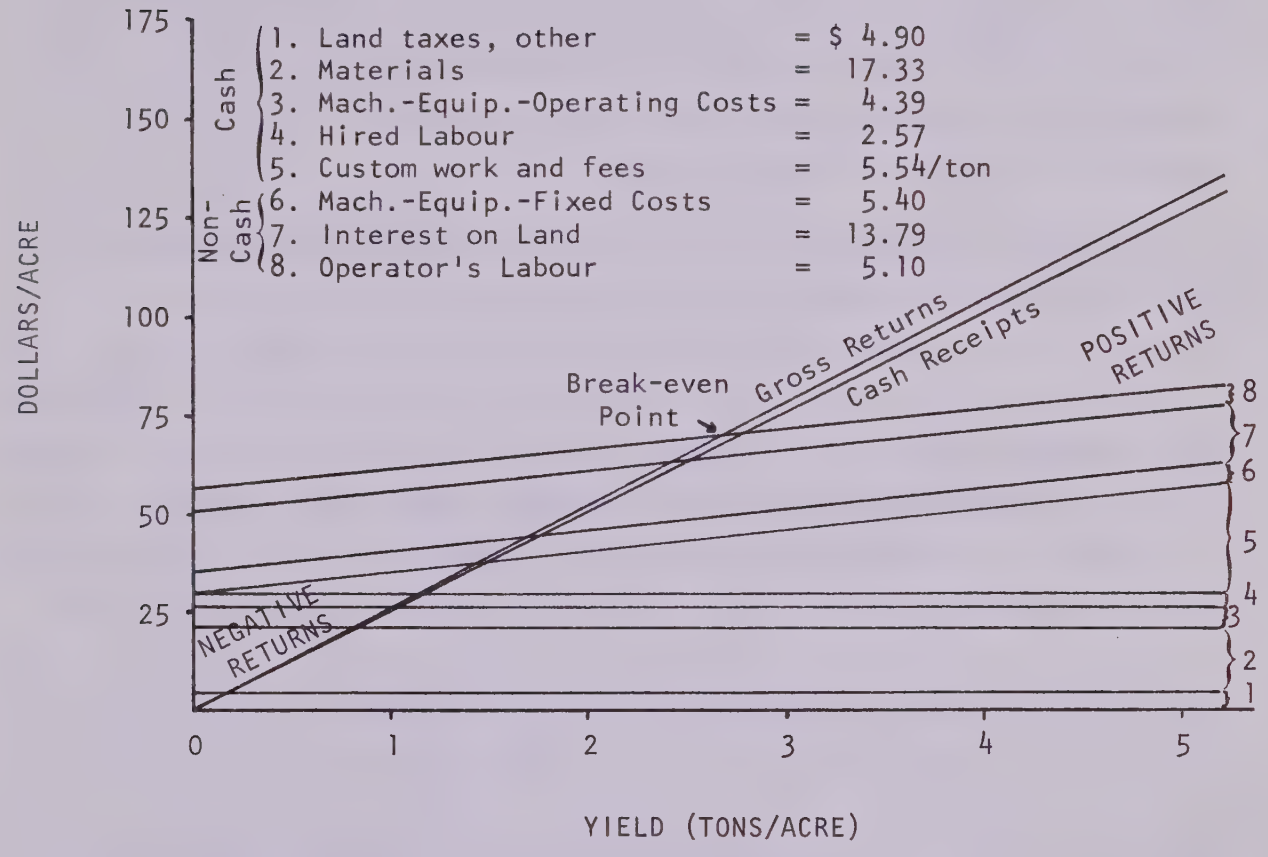


Figure 5 shows the relationship between yields of corn per acre and production costs and returns. Although there is no variation in the price received per ton ($25.00), quality of the crop can have an effect on net yield, thus lowering or raising gross returns per acre. No variation in costs of materials is shown to correspond to the various yields on the graph. The effect of cultural and management practices on yields can be measured with some accuracy on individual farms where all but a few factors are kept constant. Increasing material costs such as fertilizer to correspond to

increased yields would be inaccurate for the group as a whole. For an individual, however, additional expenses per acre are justified up to the point where they are less than or equal to the additional returns per acre. For example, with the price of corn at $25.00 per ton or $1.25 per 100 pounds a grower would maximize his revenue if he produced the last 100 pounds of corn at a cost of less than or equal to $1.25. These costs could take the form of increased fertilizer application, additional land preparation and irrigation, etc. Yield responses to such production practices are obtained through research or experience where yield increases can be significantly related to increases of specific inputs.

The minimum yields required to cover the average costs per acre for the study group are listed below.

	Tons/Acre
Cash Costs	1.50
Total Costs (exc. land interest, operator and family labour)	1.75
Total Costs (exc. operator and family labour)	2.45
Total Costs	2.71

Based on these average costs, yields in excess of 1.75 tons per acre are required to pay for any operator and family labour plus the opportunity cost of land ownership. The break-even point where total production costs are covered is 2.71 tons per acre. Yields above this provide a return to risk and management. If in the long run, yields fall below this, growers will either be forced into taking less for their labour or shift their land, labour, capital and management into activities which are more profitable.

B. GREEN PEAS

Gross Returns

An average yield of 1.24 tons per acre at a value of $95.20 per ton returned $118.03 per acre to the operator. All but 1% of the gross returns were obtained from the cash sale of the crop. The value per ton sold depended upon the tenderness of the peas. Discussion of the factors affecting price is contained in Section IV.

Production Costs

Expenses are classified according to input in Table 6. Total production costs were $104.93 per acre and $84.63 per ton. Material cost of $44.03 per acre was the greatest input expense item, making up 42% of total production costs. Custom work at $22.32 per acre and land costs of $17.64 were the next two greatest expenses, followed by machinery expenses, insurance, fees and labour. Cash costs were 78.4% of total production costs while non-cash costs accounted for 21.6%.

Table 7 presents costs on a seasonal basis. Pre-season expenses were $3.14 per acre. Seed bed preparation and seeding were $42.90 per acre while summer operations were $7.54 per acre. Fall operations (custom harvesting and hauling) were $22.32 per acre.

Gross Cash Margin and Net to Risk and Management

When cash expenses were subtracted from cash receipts, the growers were left with an average of $34.46 per acre. The gross cash margin figure is often used by growers to compare the profitability of crops. They are willing to accept more risk and heavier labour requirements if sufficient cash returns are generated. Net to risk and management, the residue after all direct and opportunity costs have been subtracted from gross value was $597.00 per enterprise, $10.57 per ton and $13.10 per acre.

Table 6 Average Costs and Returns Per Enterprise, Per Acre, And Per Ton for Green Peas, 1969

No. of Enterprises	18
Average Size/Enterprise (acres)	45.57
Average Yield/Acre (tons)	1.24

	Per Enterprise	Per Ton	Per Acre	% of Total Cost
Receipts				
Value of peas sold	$5318.83	$94.14	$116.71	
Other misc. income	60.00	1.06	1.32	
Gross Returns	$5378.83	$95.20	$118.03	
Expenses				
Land Costs				
Taxes	230.83	4.08	5.07	
Interest	572.93	10.14	12.57	
Total	$ 803.76	$14.22	$ 17.64	16.8
Labour Costs				
Operator	172.47	3.05	3.79	
Hired	48.47	0.86	1.06	
Total	$ 220.94	$ 3.91	$ 4.85	4.6
Material Costs				
Seed	1399.07	24.76	30.70	
Fertilizer	444.34	7.87	9.75	
Spray	163.16	2.89	3.58	
Total	$2006.57	$35.52	$ 44.03	42.0
Machinery-Equipment				
Tractor	284.36	5.03	6.24	
Implements & Equipment	218.93	3.88	4.80	
Total	$ 503.29	$ 8.91	$ 11.04	10.5
Custom Work (harvest)	$1017.11	$18.00	$ 22.32	21.3
Other (fees, insurance)	$ 230.09	$ 4.07	$ 5.05	4.8
TOTAL PRODUCTION COSTS	$4781.76	$84.63	$104.93	100.0
NET TO RISK & MANAGEMENT	$ 597.07	$10.57	$ 13.10	
CASH RECEIPTS	$5318.83	$94.14	$116.71	
CASH EXPENSES	$3747.93	$66.33	$ 82.23	
GROSS CASH MARGIN	$1570.90	$27.81	$ 34.46	

Table 7 Average Costs and Returns Per Acre According to Field Operations for Green Peas, 1969

No. of Enterprises	18
Average Size/Enterprise (acres)	45.57
Average Yield/Acre (tons)	1.24

	Value Per Acre	Hours Per Acre	% of Total Operation Costs
Gross Returns	$118.03		
Pre-Season Expenses			
Labour	1.12	0.83	
Machinery (operating)	1.15	0.80	
Material	0.87		
Total	$ 3.14		4.1
Seed Bed Preparation			
Labour	1.62	1.18	
Machinery (operating)	1.70	0.96	
Material	39.58		
Total	$ 42.90		56.5
Summer Operations			
Labour	2.11	1.44	
Machinery	1.85	3.23	
Material	3.58		
Total	$ 7.54		10.0
Fall Operations	$ 22.32		29.4
TOTAL OPERATION COSTS	$ 75.90		100.0
+ OTHER CASH COSTS[1/]	10.12		
+ INTEREST & DEPREC. ON MACHINERY	6.34		
+ INTEREST ON LAND	12.57		
TOTAL PRODUCTION COSTS	$104.93		
NET TO RISK & MANAGEMENT	$ 13.10		

1/ crop insurance, taxes, misc.

Break-Even Analysis for Green Peas

Figure 6 The Relationship Between Yields and Costs and Returns Of Green Peas, 1969

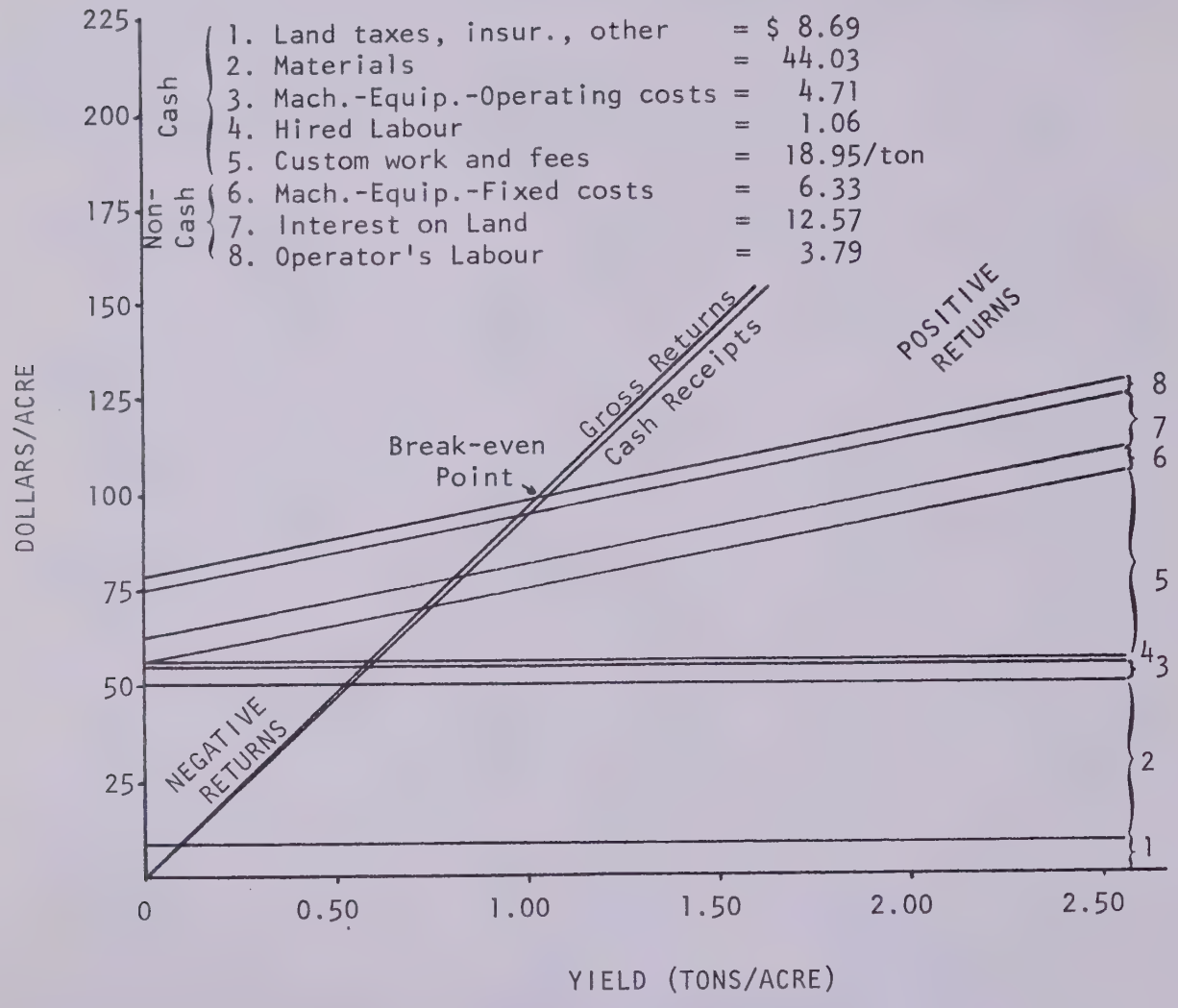


Figure 6 shows the relationship between yields of peas per acre and production costs and returns. Gross returns are based on a value of $95.20 per ton while cash returns are based on a price of $94.14 per ton which corresponds to a tenderometer reading of 100-101 for late peas or 111-112 for early peas. No variation in costs of material is shown to correspond with the various yields on the graph. The effect of cultural and management

practices on yield can be measured on individual farms where all but a few factors are constant. Increasing material costs such as fertilizer to correspond to increased yields would be inaccurate for the group as a whole. For an individual, however, additional expenses per acre are justified up to the point where they are less than or equal to the additional returns per acre. For example, with the price of peas at $95.20 per ton or $4.76 per 100 pounds, a grower would maximize his revenue if he produced the last 100 pounds of peas at a cost of less than or equal to $4.76.

The minimum yields at a price of $95.20 per ton required to cover the average costs per acre for the study group are listed below.

	Tons/Acre
Cash Costs	0.78
Total Costs (exc. land interest, operator and family labour)	0.85
Total Costs (exc. operator and family labour)	1.01
Total Costs	1.08

Based on the average costs for the group, yields in excess of 0.85 tons per acre are required to pay for any of the operator's labour plus the opportunity cost of land ownership. The break-even point, where total production costs are covered is 1.08 tons per acre. Yields above this provide a return to risk and management. If in the long run, yields fall below this, growers will either be forced into taking less for their labour or shift their land, labour, capital and management into activities which are more profitable.

C. COMPARISON BETWEEN SWEET CORN AND GREEN PEAS

In each region where agricultural products are produced, farmers attempt to maximize income and minimize risk by allocating their resources to different enterprises. In the irrigation areas of Southern Alberta, crops such as sugar beets, wheat, corn, peas and potatoes compete for the same resources. Tables 8 and 9 contain data on a per enterprise and per acre basis for ease in comparing production costs, returns and physical requirements for labour and machine use.

Gross Cash Margin and Net to Risk and Management

Price per ton paid the producer, yields and costs were such for the growers in this study that little difference was visible in the profitability per acre between these crops. The gross cash margin for corn and peas per acre was $35.25 and $34.47 respectively while net to risk and management was $11.95 and $13.10. On an enterprise basis, these returns were greater for corn than for peas because of greater crop area per enterprise. Many factors other than returns per acre make these crops attractive to some growers and less to others. Such items as farm size, labour requirements, size of contract available, soil type, location, etc. have to be considered in addition to the production costs and returns evaluated in this study.

Production Costs

Total production costs are much higher per acre for peas than for corn. Since the gross cash margin and net returns per acre are practically the same, advantages and disadvantages of production can be assembled to a certain degree by comparing the cost of individual input items as well as the time period in which they are incurred. Tables 8 and 9 show the comparison of costs and returns on a per enterprise and a per acre basis.

Land

Because of the proximity of the growing areas of corn and peas, little difference in taxes and interest costs was observed.

Table 8 Average Costs and Returns Per Enterprise And Per Acre for Sweet Corn and Green Peas, 1969

	CORN	PEAS
No. of Enterprises	9	18
Average Size/Enterprise (acres)	52.18	45.57
Average Yield/Acre (tons)	3.31	1.24

	PER ENTERPRISE		PER ACRE		% of Total Costs	
	CORN	PEAS	CORN	PEAS	CORN	PEAS
Gross Returns	$4369.30	$5378.83	$83.76	$118.03		
Expenses						
Land Costs						
Taxes	255.39	230.83	4.89	5.07		
Interest	719.61	572.93	13.79	12.57		
Total	$ 975.00	$ 803.76	$18.68	$ 17.64	26.0	16.7
Labour Costs						
Operator	250.21	172.47	4.80	3.79		
Family	15.75	---	0.30	---		
Hired	134.10	48.47	2.57	1.06		
Total	$ 400.06	$ 220.94	$ 7.67	$ 4.85	10.7	4.6
Material Costs						
Seed	288.95	1399.07	5.54	30.70		
Fertilizer	602.50	444.34	11.54	9.75		
Spray	12.89	163.16	0.25	3.58		
Total	$ 904.34	$2006.57	$17.33	$ 44.03	24.1	42.0
Machinery & Equipment						
Tractor	366.29	284.36	7.03	6.24		
Implements & Equip.	144.55	218.93	2.77	4.80		
Total	$ 510.84	$ 503.29	$ 9.80	$ 11.04	13.6	10.5
Custom Work						
Harvesting	604.46	1017.11	11.59	22.32		
Hauling	265.08	---	5.08	---		
Total	$ 869.54	$1017.11	$16.67	$ 22.32	23.2	21.3
Other (fees, insur.)	$ 86.36	$ 230.09	$ 1.66	$ 5.05	2.3	4.8
TOTAL PRODUCTION COSTS	$3746.14	$4781.76	$71.81	$104.93	100.0	100.0
NET TO RISK & MANAGEMENT	$ 623.16	$ 597.07	$11.95	$ 13.10		
CASH RECEIPTS	$4317.63	$5318.83	$82.77	$116.71		
CASH EXPENSES	$2478.62	$3747.93	$47.52	$ 82.24		
GROSS CASH MARGIN	$1839.01	$1570.90	$35.25	$ 34.47		

Table 9 Comparison of Average Costs & Returns Per Acre of Sweet Corn & Green Peas According to Field Operations - 1969

	CORN	PEAS
No. of Enterprises	9	18
Average Size/Enterprise (acres)	52.18	45.57
Average Yield/Acre (tons)	3.31	1.24

	VALUE / ACRE		HOURS / ACRE		% of Total Costs	
	CORN	PEAS	CORN	PEAS	CORN	PEAS
Gross Returns	$83.76	$118.03				
Pre-Season Operations						
Labour	0.24	1.12	0.16	0.83		
Machinery	0.30	1.15	0.14	0.80		
Material	0.57	0.87				
Total	$ 1.11	$ 3.14			2.41	4.1
Seed Bed Prep. & Seeding						
Labour	2.40	1.62	1.67	1.18		
Machinery	2.36	1.70	1.65	0.96		
Material	16.51	39.58				
Total	$21.27	$ 42.90			46.2	56.5
Summer Operations						
Labour	4.98	2.11	3.92	1.45		
Machinery	1.73	1.85	3.17	3.23		
Material	0.25	3.58				
Total	$ 6.96	$ 7.54			15.1	10.0
Fall Operation Costs	$16.72	$ 22.32			36.3	29.4
TOTAL OPERATION COSTS	$46.06	$ 75.90			100.0	100.0
+ OTHER CASH COSTS	6.56	10.13				
+ INT. & DEPREC. ON MACH.	5.40	6.33				
+ INTEREST ON LAND	13.79	12.57				
TOTAL PRODUCTION COSTS	$71.81	$104.93				
% Operation Costs to Total Production	64.1%	72%				

Labour Costs

Labour requirements, especially during summer months, are higher for corn than for peas. In addition to the operator's labour, family and hired labour is necessary for hoeing. Labour input per acre was 3.92 hours for corn and only 1.45 hours for peas. Although labour costs are not the most costly input, they are very important and should definitely be considered when comparing one specialty crop with another.

Material Costs

Material costs are much higher for peas than for corn since the cost of seed for peas is $30.70 per acre while it is only $5.54 per acre for corn. Because of such high seed costs, crop insurance is necessary to offset the risk involved for pea growers. Fertilizer applications were slightly higher for corn than for peas. Although the use and cost of herbicides is substantially higher in pea production, this cost is counterbalanced by the higher labour requirements for corn.

Machinery Costs

Variation in machinery costs between farms are due to size, type and hours of use. The difference in costs between the corn and pea growers on the study on a per acre basis can be attributed mainly to use in hours per acre for most implements. More cultivations were necessary to prepare land for peas than for corn during the fall preceeding the production year. Machinery costs are higher for seeding corn than peas mainly because of the smaller width covered with the row planters used. Machine costs per acre for summer operations were nearly the same for each crop.

Custom Work

Harvesting costs are slightly higher for peas than for corn. Harvesting costs (except hauling the corn) vary directly with the yield. The increased revenue from higher yields outweighs by far the extra harvesting costs.

SECTION IV - PRODUCTION ANALYSIS OF GREEN PEAS

A. NET INCOME GROUPS

Net return to risk and management per acre is often used as a measure of success in the production of a crop. High net returns per acre and sufficient size of enterprise, measured by total acres, total volume produced and enterprise net returns, are also very important. In the case of peas, where the number of acres are fixed by contract, the net return per acre is the best measure of success for the crop.

Gross returns and total costs vary with yield per acre, price per ton, material costs, labour costs, etc. Weather conditions, timeliness of field operations and weed and plant disease problems all have a significant influence on the outcome of the crop.

The farms were sorted into three groups according to "net to risk and management per acre". Producers in group III (high net income group) tended to have higher yields, smaller farms, smaller pea acreages with a higher percentage of land under irrigation.

Gross Returns and Cash Receipts (refer to Table 10, page 27)

Yield being twice as great for group III as for group I accounted for gross returns being nearly twice as high. Group III received a lower price per ton ($84.77) than either group I or II ($93.40 and $97.22 respectively). However, these higher prices were not enough to give either group I or group II an income per acre equal to that obtained by group III.

Total Production Costs and Cash Expenses

On a per acre basis, group III had higher production costs due mainly to higher custom harvesting costs. Land, machinery and equipment costs were higher while material costs (seed, fertilizer, sprays) were lower for group III. Cash expenses were similarly higher per acre for group III. On a per ton basis all costs decreased from group I to III because of increased yields.

Gross Cash Margin and Net to Risk and Management

The greater increase in gross returns, as compared to total costs, caused net returns per acre to increase drastically from group I to III. Although none of the growers on the study had a negative cash margin, those in group I would in the long run (with existing costs and returns) consider alternative uses for their resources. Negative returns in group I are due to low gross returns per acre and not to higher production costs.

Table 10 Average Costs and Returns of Net Income Groups For Green Peas, 1969

	All Records	Net Income Group[1/] I	II	III
No. of Enterprises	18	5	9	4
Average Size/Enterprise (acres)	45.57	36.9	60.0	24.0
Average Yield/Acre (tons)	1.24	0.98	1.19	2.04
Per Enterprise				
Gross Return	$5378.83	$3408.49	$6931.15	$4333.31
Total Production Costs	$4781.76	$3718.00	$6272.78	$2673.15
Net to Risk & Management	$ 595.07	$-309.51	$ 658.37	$1660.16
Per Acre				
Gross Return	$ 118.03	$ 92.37	$ 115.67	$ 180.55
Total Production Costs	$ 104.93	$ 100.76	$ 104.59	$ 114.86
Net to Risk & Management	$ 13.10	$ -8.39	$ 11.08	$ 65.69
Per Ton				
Gross Return	$ 95.20	$ 94.51	$ 97.50	$ 88.34
Total Production Costs	$ 84.63	$ 103.09	$ 88.15	$ 56.20
Net to Risk & Management	$ 10.57	$ -8.58	$ 9.35	$ 32.14

1/ Based on Net Income Per Acre

Table 11 Variations in Gross Cash Margin Between Net Income Groups For Green Peas, 1969

	All Records	Net Income Group[1/] I	II	III
No. of Enterprises	18	5	9	4
Average Size/Enterprise (acres)	45.57	36.9	60.0	24.0
Average Yield/Acre (tons)	1.24	0.98	1.19	2.04
Per Enterprise				
Cash Receipts	$5318.83	$3368.49	$6918.15	$4158.31
Cash Expenses	$3741.50	$2838.84	$5015.39	$2289.80
Gross Cash Margin	$1577.33	$ 529.65	$1902.76	$1868.51
Per Acre				
Cash Receipts	$ 116.71	$ 91.29	$ 115.34	$ 173.26
Cash Expenses	$ 82.10	$ 76.93	$ 83.63	$ 92.87
Gross Cash Margin	$ 34.61	$ 14.36	$ 31.71	$ 80.39
Per Ton				
Cash Receipts	$ 94.14	$ 93.40	$ 97.22	$ 84.77
Cash Expenses	$ 66.22	$ 78.72	$ 70.48	$ 45.44
Gross Cash Margin	$ 27.92	$ 14.68	$ 26.74	$ 39.33

1/ Based on Net Income Per Acre

Table 12 Variations in Average Costs Per Acre of Net Income Groups

	All Records	Net Income Group 1/ I	II	III
Land Costs				
Taxes	$ 5.07	$ 5.17	$ 5.00	$ 5.22
Interest	12.57	13.72	11.74	15.07
Total	$ 17.64	$ 18.89	$ 16.74	$ 20.29
Labour Costs				
Operator	$ 3.79	$ 3.78	$ 3.67	$ 4.43
Hired	1.06	0.06	1.52	0.41
Total	$ 4.85	$ 3.84	$ 5.19	$ 4.84
Material Costs				
Seed	$ 30.70	$ 31.65	$ 30.70	$ 28.88
Fertilizer	9.75	10.37	10.24	5.79
Spray	3.58	3.79	3.86	1.60
Total	$ 44.03	$ 45.81	$ 44.77	$ 36.27
Machinery-Equipment				
Tractor	$ 6.24	$ 5.81	$ 6.50	$ 5.58
Implements & Equipment	4.80	4.90	4.50	6.42
Total	$ 11.04	$ 10.71	$ 11.00	$ 12.00
Custom Work (Harvesting)	$ 22.32	$ 17.61	$ 21.36	$ 36.79
Other (Fees, Insurance)	$ 5.05	$ 3.90	$ 5.50	$ 4.67
TOTAL PRODUCTION COSTS	$104.93	$100.76	$104.59	$114.86

Cost Items	Percentage			
Land	18	19	16	18
Labour	4	4	5	4
Material	42	45	43	32
Machinery & Equipment	10	11	11	10
Custom Work	21	17	20	32
Other	5	4	5	4
Total	100	100	100	100

1/ Based on Net Income Per Acre

B. EFFECT OF PRODUCTION AND MANAGEMENT FACTORS

Yield

In this study, sample variations in gross and net income per acre were closely associated with yield per acre. Table 13 shows that when enterprises were grouped according to yield per acre, gross returns increased from $88.18 to $194.74 per acre while net to risk and management increased from -$11.41 to $82.44. Except for harvesting and land expenses, no definite trend in cost per acre either increasing or decreasing could be associated with increasing yields. No association between increased fertilizer application and increased yields was found between farms on the study. Low yields were attributed to inability to perform timely field operations (weed control, cultivating, etc.). Most of the peas were grown on land that grew a cereal grain the previous year.

Table 13 Distribution of Enterprises According to Yield Per Acre for Green Peas, 1969

	YIELD						
	Low		Medium		High		
	0.75 T & Less	0.76 - 1.00 T	1.01 - 1.25 T	1.26 - 1.50 T	1.51 - 1.75 T	1.76 - 2.00 T	2.00 Plus
No. of Enterprises	1	3	4	4	2	2	2
Average Size (acres)	17	40	77	61	21	19	36
Gross Returns	$88.18	$88.45	$105.04	$123.27	$136.06	$170.27	$194.76
Land Costs	15.66	16.03	17.01	17.38	19.21	21.66	20.19
Labour Costs	5.88	4.09	3.76	5.92	7.40	7.02	3.97
Material	53.08	38.80	48.16	43.26	36.46	46.09	34.57
Mach.-Equip.	7.95	12.71	8.79	11.48	13.37	21.63	9.86
Custom Work	13.26	15.96	18.70	23.64	30.15	35.64	38.95
Other	3.76	3.70	6.32	4.46	4.26	4.57	4.78
Total Production Costs	$99.59	$93.29	$102.74	$106.14	$110.49	$136.61	$112.32
Net to Risk & Management	-$11.41	$-4.84	$ 2.30	$ 17.13	$ 25.57	$ 33.66	$ 82.44
Fertilizer Use							
Pounds N/Acre	46.5	37.7	49.1	36.6	25.6	35.9	37.9
Pounds P/Acre	28.2	38.9	44.1	37.3	44.5	36.4	26.9
Total Nutrients in Pounds Per Acre	74.7	76.6	103.2	73.9	70.1	72.3	64.8

Size

More than 70% of all contracted pea acreage is grown on fields of 50 acres or less. Smaller fields allow for timeliness of operations by farmers and processors. Table 14 shows the distribution according to acres sown to peas. Farms with less than 34 acres in production had higher yields, gross and net returns per acre. Costs were higher mainly because of harvesting expenses.

Table 14 Distribution of Enterprises According to Size (Acres) for Green Peas, 1969

	ACRES					
	24.0 & Less	25.0 - 34.0	35.0 - 44.0	45.0 - 54.0	55.0 - 64.0	65.0 Plus
No. of Enterprises	6	2	3	1	3	3
Average Yield Per Acre	1.72	1.75	0.89	0.95	1.25	1.13
Average Size (acres)	19.2	31.0	39.7	50.9	61.8	96.0
Gross Returns	$147.09	$159.62	$88.45	$94.20	$114.82	$115.96
Land Costs	21.94	20.50	17.04	16.17	14.88	18.29
Labour Costs	6.80	3.94	4.11	5.64	4.60	4.60
Material	41.55	40.24	39.80	42.21	46.49	46.32
Machinery-Equipment	14.92	11.58	12.71	6.66	7.88	11.50
Custom Work	30.90	31.42	15.96	17.07	22.56	20.33
Other	4.33	4.52	3.70	3.85	4.17	6.78
Total Production Costs	$120.44	$112.50	$93.32	$91.60	$100.58	$107.82
Net to Risk & Management	$ 26.65	$ 47.12	$-4.87	$ 2.60	$ 14.24	$ 8.14

Total Production Costs

Increasing costs per acre between the farms on the study could not be associated with any single item. Between farms with costs of less than $89.99 and $90.00 to $100.99, material costs (fertilizer) was the main cause of increase. Between farms with $90.00 to $100.99 and farms with $101.00 to $110.99 total costs, a combination of items prevailed--land, machinery-equipment,

custom work, fees and insurance. Enterprises with production costs of $121.00 and over per acre had higher labour, material (sprays), machinery-equipment and harvesting costs than any of the other groups. Yields, gross and net returns were also greater for this group.

Table 15 Distribution of Enterprises According to Total Production Costs Per Acre for Green Peas, 1969

	TOTAL COSTS PER ACRE					
	All Records	89.99 & Less	90.00-100.99	101.00-110.99	111.00-120.99	121.00 Plus
No. of Enterprises	18	2	6	5	2	3
Yield Per Acre	1.24	1.24	1.02	1.26	1.62	1.84
Acres Sown Per Ent.	45.6	30.0	44.7	77.6	23.0	32.2
Gross Returns	$118.03	$110.38	$97.87	$125.55	$115.46	$154.92
Land Costs	17.64	16.11	16.37	17.34	22.77	20.41
Labour Costs	4.85	4.06	4.65	4.52	5.39	8.27
Material	44.03	32.18	44.31	41.35	40.96	45.97
Machinery-Equipment	11.04	9.59	8.79	11.04	13.00	18.61
Custom Work	22.32	22.32	18.43	22.60	29.07	33.10
Other	5.05	4.06	3.93	6.17	4.27	4.43
Total Production Costs	$104.93	$ 88.32	$96.48	$107.60	$115.46	$130.79
Net to Risk & Management	$ 13.10	$ 22.06	$ 1.41	$ 17.95	$ 20.01	$ 24.13

Price

Tenderometer readings and the classification into early and late peas determines the price per ton. All but one grower in the study sold "late" peas. Prices ranged from $82.00 to $119.00 per ton with a weighted average price of $95.20. Table 16 includes a price list with corresponding tenderometer readings. Where lower yields are due to size and density of the peas, a price differential is applied to allow the per ton value to vary without affecting per acre revenue. Increases in yield per acre required to make an

increased tenderometer reading range as profitable as the one before are listed. For example, to make late peas at the 101-105 reading as profitable as the 96-100 range, an increase of 222 pounds per acre would be required. Also listed is the maximum decrease in yield allowed to make early peas as profitable as late peas at each tenderometer reading range. For example, the higher priced early peas would be as profitable as the late peas at a tenderometer reading of 101-105 if the difference in yield is not more than 300 pounds or for a tenderometer reading of 101-105, a yield of 2,000 pounds of late peas is equal to a yield of 1,700 pounds of early peas in value.

Table 16 Relationship Between Tenderometer Readings and Price Per Ton for Early and Late Peas

Tenderometer Reading	EARLY		LATE		Maximum Allowable Decrease In Yield Per Acre (lbs.)
	Value Per Ton ($)	Increase Required Per Acre (lbs.)	Value Per Ton ($)	Increase Required Per Acre (lbs.)	
0 - 85	151.00	---	134.00	---	220
86 - 90	136.00	220	120.00	233	240
91 - 95	119.00	286	108.00	222	200
96 - 100	112.00	125	100.00	160	220
101 - 105	106.00	113	90.00	222	300
106 - 110	100.00	112	82.00	195	360
111 - 115	92.00	174	78.00	103	300
116 - 120	86.00	139	74.00	108	280
121 - 125	80.00	150	68.00	176	300
126 +	72.00	220	66.00	60	160

APPENDIX

APPENDIX

Table A-1 A Comparison of Costs and Returns Between 1969 Processing Peas Study and Other Studies in Alberta

	Taber Area[1/] 1954 - 1958	1964[2/]	1969
No. of Enterprises	15	36	18
Average Size (acres)	32.0	53.8	45.6
Average Yield/Acre	1.00	1.06	1.24
Price Per Ton Sold	$63.34	$ 89.84	$ 94.14
Receipts/Acre			
Value of Peas Sold	$63.34	$ 95.23	$116.71
Miscellaneous Receipts	8.46	9.14	1.32
Gross Returns	$71.80	$104.37	$118.03
Expenses/Acre			
Land Costs	$11.70	$ 12.22	$ 17.64
Labour Costs	14.67	5.46	4.85
Material	22.32	36.54	44.03
Machinery-Equipment	17.48	12.87	11.04
Custom Work	14.25	20.73	22.32
Other	--	2.24	5.05
Total Production Costs/Acre	$80.42	$ 90.06	$104.93
Net to Risk and Management/Acre	$-8.62	$ 14.31	$ 13.10

1/ Porter, K.D. and McBain, B.J.; Irrigated Specialty Crops in Alberta, 1954-58

2/ Porter, K.D. and McBain, B.J.; Production Economics of Peas for Freezing and Canning, Alberta, 1964

Little variation between the net returns to risk and management was observed between 1964 and 1969. Higher gross returns per acre, because of higher prices and yields, were offset by higher production costs. The increase in land costs was due to a greater opportunity cost on the land used for growing peas. Fertilizer costs accounted for increased material costs. Labour costs per acre for 1964 and 1969 have decreased substantially from 1954-58 because harvesting operations are now performed by the processors.

ESTIMATING COST PARAMETERS FROM SAMPLE STATISTICS FOR GREEN PEAS, 1969

Average costs per acre for production inputs were presented in Section IV. The accuracy of these figures depends on how closely the sample actually represents the average costs per acre for all acres that produced the crop. In estimating population or universe parameters (e.g. average cost of operator's labour) from a sample, deviations from the true average can be the result of sampling errors. This was minimized in the study by using a stratified random sample. This, however, does not eliminate the variation in specific costs per acre between one farm and another. The greater this variation, the more difficult it is to ascertain that the average of the group represents the true average. For each cost item on page 3 of the Appendix, the confidence intervals ($\bar{X} \pm t_{0.95}\hat{\sigma}_{\bar{x}}$) are given. As expected, some of these costs are very similar for each farm and little variation is noticeable (e.g. irrigation taxes) while others have greater variation (e.g. hired labour, fertilizer and sprays). The precision of the sample average for each cost item can be increased by using a larger sample.

The precision of average costs which show large variations such as hired labour can be increased by obtaining data from a greater number of growers. The cost of obtaining very high precision may be too great since doubling the precision means using a sample four times as large. The average obtained from using a sample is only one figure within an interval that contains the true average with a specified degree of reliability (e.g. 95%). The interval, known as the confidence interval, can be narrowed only at the risk of an incorrect statement. Conversely, the risk of an incorrect statement can be reduced only by widening the confidence interval.

Table A-2 contains a list of all major cost items. For each cost item the sample average ($\bar{X}$) is given. The sample standard deviation (S_x) for each of these items gives a measure of dispersion. The standard deviation of the sampling distribution, or the standard error of the sample mean ($\hat{\sigma}_{\bar{x}}$)

is used in calculating the confidence intervals ($\bar{X} \pm t_{0.95}\hat{\sigma}_{\bar{x}}$). The inferred cost parameters should be interpreted in the following manner:

> If many samples of size n = 18 were selected from the population and confidence intervals were computed for each, 95% of these intervals would include the true mean of the population. In this study, it is assumed that the interval obtained is one of 95 percent. For each cost item the sample mean ($\bar{X}$) is within $\pm t_{0.95}\hat{\sigma}_{\bar{x}}$ of the true mean or the range indicated will contain, 95 times out of 100, the actual average cost of the item listed.

The confidence interval for Total Costs is $94.05 to $117.01 with an average of $105.53. The true average is within the interval at the 95% confidence level. Accepting $105.53 as the actual average is a compromise since it lies exactly between $94.05 and $117.01.

Table A-2 Estimated Cost Parameters from Sample Statistics For Green Peas, 1969

n = 18 enterprises

$\hat{\sigma}_{\bar{x}}$ = estimated standard error of mean

S_x = sample standard deviation

$t_{0.95}$ = value of t (0.95 confidence coefficient) at n - 1 degrees of freedom

	$\bar{X}$	S_x	$\hat{\sigma}_{\bar{x}}$	$\bar{X} \pm t_{0.95}\hat{\sigma}_{\bar{x}}$	
Land Costs					
Land Taxes	$ 2.77	$ 0.53	$0.13	$ 2.53	$ 3.01
Irrigation Taxes	2.29	0.50	0.12	2.06	2.52
Interest	13.58	3.14	0.76	12.16	15.00
Total	$ 18.64	$ 4.17	$1.01	$16.75	$ 20.53
Labour Costs					
Operator	$ 4.57	$ 2.31	$0.56	$ 3.53	$ 5.61
Hired	0.68	1.24	0.30	0.12	1.24
Total	$ 5.25	$ 3.55	$0.86	$ 3.65	$ 6.85
Material					
Seed	$ 30.87	$ 4.68	$1.14	$28.75	$ 32.99
Fertilizer	9.40	3.76	0.91	7.69	11.11
Spray	2.94	2.58	0.63	1.77	4.11
Total	$ 43.21	$11.02	$2.68	$38.21	$ 48.21
Machinery-Equipment (Oper.)	$ 4.77	$ 2.27	$0.55	$ 3.74	$ 5.80
Machinery-Equipment (Fixed)	$ 6.65	$ 3.14	$0.76	$ 5.23	$ 8.07
Other (Crop Ins., Fees, Misc.)	$ 3.51	$ 1.19	$0.29	$ 2.97	$ 4.05
Total Costs (Exc. Harvesting)	$ 82.03			$70.55	$ 93.51
Harvesting Costs (1.24 tons/acre)	$ 23.50			$23.50	$ 23.50
Total Costs	$105.53			$94.05	$117.01

Table A-3 Ranges of Yields, Acres, Costs and Returns For Processing Corn

No. of Enterprises	9		
Average Size/Enterprise (acres)	30.00 to 100.00		
Average Yield/Acre (tons)	2.25 to 4.93		
	Per Acre		
Receipts			
Value of corn sold	$ 56.25	to	$102.22
Other misc. income	0.00		5.42
Gross Returns			
Expenses			
Land Costs			
Taxes	$ 4.00		$ 6.90
Interest	7.20		18.00
Labour Costs			
Operator	0.56		11.54
Hired	0.00		10.91
Family	0.00		2.82
Material Costs			
Seed	4.75		7.13
Fertilizer	4.28		16.35
Spray	0.00		1.05
Machinery-Equipment			
Tractor	3.65		7.52
Implements and Equipment	1.10		4.41
Custom Work			
Harvesting	7.88		14.31
Hauling	0.00		14.08
Other (fees, insurance)	1.12		-2.04
Total Production Costs	$ 56.26		$ 78.81
Net to Risk and Management	$-19.40		$ 26.91
Cash Receipts	$ 56.25		$102.22
Cash Expenses	$ 37.19		$ 67.06
Gross Cash Margin	$ 3.56		$ 48.06

Table A-4 Sweet Corn for Processing - U.S.A.[1/]

Acreage,[2/] Yield[3/] and Prices,[4/] 1959-63 - 1969

		Average 1959 - 63	1965	1966	1967	1968	1969
EAST	- Acres	66.9	55.3	49.6	52.7	58.0	46.2
	- Yield	3.43	3.36	2.98	4.09	3.33	3.62
	- Price	21.24	23.92	23.03	23.34	27.33	24.80
MIDWEST	- Acres	282.9	234.6	288.5	301.2	322.1	289.1
	- Yield	3.69	4.07	4.14	4.08	4.56	4.23
	- Price	18.19	21.46	21.49	23.13	23.14	23.40
WEST	- Acres	58.6	72.6	90.8	99.7	118.1	97.6
	- Yield	5.25	5.65	6.19	5.85	6.25	6.89
	- Price	22.96	24.07	25.49	29.79	30.18	28.31
OTHER	- Acres	14.7	14.2	16.8	17.0	21.0	15.8
	- Yield	4.03	4.82	3.54	4.26	3.80	6.71
	- Price	20.51	19.78	21.38	23.13	23.53	25.07
FOR FREEZING	- Acres	77.9	99.4	121.9	118.0	126.2	114.1
	- Yield	4.08	4.35	4.93	4.97	5.44	5.67
	- Price	22.40	24.20	24.83	28.50	28.70	27.80
FOR CANNING	- Acres	345.4	277.5	323.8	352.6	393.0	334.6
	- Yield	3.32	4.26	4.20	4.30	4.56	4.37
	- Price	18.90	21.80	21.83	23.60	24.40	23.90
PROCESSING	- Acres	423.2	376.7	445.7	470.6	519.2	448.7
	- Yield	3.87	4.28	4.40	4.47	4.78	4.70
	- Price	19.60	22.40	22.75	25.00	25.60	25.10
FRESH MARKET	- Acres	208.0	204.5	194.8	190.9	173.6	185.4
	- Yield	3.18	3.29	3.12	3.44	3.46	3.39
	- Price	--	--	--	--	--	--
TOTAL U.S.	- Acres	623.1	631.2	581.2	640.4	661.5	692.8
	- Yield	3.68	3.62	4.42	4.31	4.66	3.95
	- Price	--	--	--	--	--	--

[1/] Source: The Almanac of the Canning, Freezing, Preserving Industries, 55th Edition, 1970.

[2/] '000 acres (rounded) [3/] tons/acre [4/] $/ton

Table A-5 Green Peas for Processing - U.S.A.[1/]

Acreage,[2/] Yield[3/] and Prices,[4/] 1959-63-1969

		Average 1959 - 63	1965	1966	1967	1968	1969
EAST	- Acres	30.0	29.6	39.6	42.6	46.8	37.0
	- Yield	n.a.	n.a.	1.44	1.42	1.54	1.42
	- Price	n.a.	n.a.	115.12	114.62	111.00	109.00
MIDWEST	- Acres	153.5	188.2	230.6	239.0	233.5	210.6
	- Yield	n.a.	n.a.	1.05	1.22	1.28	1.19
	- Price	n.a.	n.a.	108.97	111.00	107.00	110.00
WEST	- Acres	154.8	170.4	163.7	176.7	171.8	156.5
	- Yield	n.a.	n.a.	1.28	1.35	1.24	1.41
	- Price	n.a.	n.a.	96.56	104.00	106.00	101.00
OTHER	- Acres	46.5	53.4	--	--	--	--
	- Yield	1.51	1.34	--	--	--	--
	- Price	90.40	101.10	--	--	--	--
FOR FREEZING	- Acres	138.7	159.8	149.7	159.8	165.7	148.8
	- Yield	1.33	1.46	1.32	1.42	1.38	1.40
	- Price	86.60	99.50	98.50	105.00	104.00	104.00
FOR CANNING	- Acres	246.0	281.9	284.4	298.4	286.4	255.4
	- Yield	1.27	1.31	1.09	1.22	1.24	1.24
	- Price	85.70	99.90	108.39	111.00	109.00	107.00
PROCESSING	- Acres	384.7	441.6	434.1	458.2	452.1	404.2
	- Yield	1.29	1.36	1.17	1.28	1.29	1.30
	- Price	86.10	99.80	105.54	109.00	107.00	106.00
FRESH MARKET	- Acres	6.0	4.6	2.0	1.8	2.0	n.a.
	- Yield	0.98	1.85	1.75	1.89	1.5	n.a.
	- Price	--	--	--	--	--	--
TOTAL U.S.	- Acres	390.7	446.2	436.1	460.0	454.1	n.a.
	- Yield	1.28	1.37	1.18	1.29	1.29	n.a.
	- Price	--	--	--	--	--	--

[1/] Source: The Almanac of the Canning, Freezing, Preserving Industries, 55th Edition, 1970.

[2/] '000 acres (rounded) [3/] tons/acre [4/] $/ton